

MAPPING GRADE 5 SCIENCE INSTRUCTION

Concept: Characteristics of Matter

PWC Strand: Physical Science

CMS Unit Test: Matter

Reporting Category: Force, Motion, Energy, Matter

PWC Objective: 5.4.1

The student will investigate and understand that matter is anything that has mass, takes up space, and occurs as a solid, liquid, or gas. Key concepts include:

- atoms, elements, molecules, and compounds **(SOL 5.4a)**
- mixtures including solutions **(SOL 5.4b)**
- the effect of heat on the states of matter **(SOL 5.4c)**

What Students Should Know (Critical Attributes)	What Students Should Be Able To Do (Essential Skills)
<p><u>Essential Questions:</u></p> <ul style="list-style-type: none"> • What is matter and how is it organized? • What is the difference between mixtures and solutions? • What do we mean by the terms physical change and chemical change? • What are the three forms of matter and how can we change matter from one form to another? <p><u>Critical Attributes:</u></p> <p>5.4a All matter, regardless of its size, shape, or color, is made of particles (atoms and molecules) that are too small to be seen by the unaided eye.</p> <p>5.4a There are more than 100 known elements that make up all matter. The smallest part of an element is an atom.</p> <p>5.4a When two or more elements combine to form a new substance, it is called a <i>compound</i>. There are many different types of compounds because atoms of elements combine in many different ways (and in different whole number ratios) to form different compounds. Examples include water (H₂O) and table salt (NaCl). The smallest part of a compound is a molecule.</p>	<ul style="list-style-type: none"> • Construct and interpret simple models of atoms, elements, molecules, and compounds. • Compare and contrast elements and compounds and atoms and molecules.

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What Students Should Know (Critical Attributes)	What Students Should Be Able To Do (Essential Skills)
<p>5.4b A <i>mixture</i> is a combination of two or more substances that do not lose their identifying characteristics when combined. A <i>solution</i> is a mixture in which one substance dissolves in another.</p> <p>5.4c As its temperature increases, many kinds of matter change from a solid to a liquid to a gas. As its temperature decreases, that matter changes from a gas to a liquid to a solid.</p>	<ul style="list-style-type: none">• Compare and contrast mixtures and solutions.• Construct and interpret a sequence of models (diagrams) showing the activity of molecules in all three states of matter.• Design an investigation to determine how heat affects the states of matter (e.g., water). Include in the design ways information will be recorded, what measures will be made, what instruments will be used, and ways the data will be graphed. <p>Teacher note:</p> <p>This is the student's first introduction to such abstract ideas as atoms, elements, molecules, and compounds and these concepts should only be introduced. More detailed concepts related to atomic and molecular structure are not appropriate until middle school. <i>Although it is necessary to discuss sub-atomic particles in general, students should not be held responsible for the specifics of atomic structure until Grades 6 and 8.</i></p>

MAPPING GRADE 5 SCIENCE INSTRUCTION

Concept: Characteristics and Transmission of Sound

PWC Strand: Physical Science

CMS Unit Test: Sound

Reporting Category: Force, Motion, Energy, Matter

PWC Objective: 5.4.2

The student will investigate and understand how sound is transmitted and is used as a means of communication. Key concepts include:

- frequency, waves, wavelength, vibration **(SOL 5.2a)**
- the ability of different media (solids, liquids, and gases) to transmit sound **(SOL 5.2b)**
- uses and applications of sound (voice, sonar, animal sounds, and musical instruments) **(SOL 5.2c)**

What Students Should Know (Critical Attributes)	What Students Should Be Able To Do (Essential Skills)
<p><u>Essential Questions:</u></p> <ul style="list-style-type: none"> • How are sounds produced? • How does sound travel? • How can we measure and describe sound? • What are some useful applications of sound? <p><u>Critical Attributes:</u></p> <p>5.2 a Sound travels in waves and can be described by the wavelength and frequency of the waves. A <i>wave</i> is a disturbance moving through a medium (solid, liquid, or gas).</p> <p>5.2a The <i>frequency</i> of sound is the number of vibrations in a given unit of time.</p> <p>5.2a Sound is a compression wave moving outward from its source. The <i>wavelength</i> of sound is the distance between two compressions.</p> <p>5.2a <i>Pitch</i> is determined by the frequency of a vibrating object. Objects vibrating faster have a higher pitch than objects vibrating slower.</p> <p>5.2b Sound is a form of energy produced and transmitted by vibrating matter.</p>	<ul style="list-style-type: none"> • Use the basic terminology of sound to describe what sound is, how it is formed, how it affects matter, and how it travels. • Create and interpret a model or diagram of a compression wave. • Explain the relationship between frequency and pitch. • Design an investigation to determine what factors affect the pitch of a vibrating object. This includes vibrating strings, rubber bands, beakers/bottles of air and water, tubes (as in wind chimes), and other common materials.

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What Students Should Know (Critical Attributes)	What Students Should Be Able To Do (Essential Skills)
<p>5.2b Sound travels more quickly through solids than through liquids and gases because the molecules of a solid are closer together. Sound travels most slowly through gases because the molecules of a gas are farthest apart.</p> <p>5.2c Some animals make and hear ranges of sound vibrations different from those that humans can make and hear.</p> <p>5.2c Musical instruments vibrate to produce sound.</p>	<ul style="list-style-type: none">• Explain why sound waves travel only where there is matter to transmit them.• Compare and contrast the sounds (voice) that humans make and hear to that of other animals. This includes bats, dogs, and whales.• Compare and contrast sound traveling through a solid with sound traveling through the air. Explain how different media (solid, liquid, and gas) will affect the transmission of sound.• Compare and contrast how different kinds of musical instruments make sound. This includes string instruments, woodwinds, percussion instruments, and brass instruments.

MAPPING GRADE 5 SCIENCE INSTRUCTION

Concept: Characteristics and Behavior of Light

PWC Strand: Physical Science

CMS Unit Test: Light

Reporting Category: Force, Motion, Energy, Matter

PWC Objective: 5.4.3

The student will investigate and understand basic characteristics of visible light and how it behaves. Key concepts include:

- the visible spectrum and light waves **(SOL 5.3a)**
- refraction of light through water and prisms **(SOL 5.3b)**
- reflection of light from reflective surfaces (mirrors) **(SOL 5.3c)**
- opaque, transparent, and translucent **(SOL 5.3d)**
- historical contributions in understanding light. **(SOL 5.3e)**

What Students Should Know (Critical Attributes)	What Students Should Be Able To Do (Essential Skills)
<p><u>Essential Questions:</u></p> <ul style="list-style-type: none"> • What is white light and how does it travel? • What are reflection, refraction, and transmission? • What does the visible spectrum consist of and how can we detect the components of the visible spectrum? • How can we describe objects in terms of their interactions with light? • What are some useful tools that have been developed to take advantage of the properties of light? <p><u>Critical Attributes:</u></p> <p>5.3 a The visible spectrum is white light that is a combination of several different wavelengths of light traveling together. These wavelengths are represented by the colors red, orange, yellow, green, blue, indigo, and violet (ROY G. BIV).</p>	<ul style="list-style-type: none"> • Explain the relationship between wavelength and the color of light. • Name the colors of the visible spectrum.

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What Students Should Know (Critical Attributes)	What Students Should Be Able To Do (Essential Skills)
<p>5.3a Light waves are characterized by their wavelengths. In the visible spectrum, red has the longest wavelength, and violet has the shortest. Wavelengths get progressively shorter from red to violet.</p> <p>5.3a Light travels in waves. Compared to sound, light travels extremely fast. It takes light from the sun less than 8½ minutes to travel 150 million kilometers to reach the Earth.</p> <p>5.3a Unlike sound, light waves travel in straight paths called <i>rays</i> and do not need a medium through which to move.</p> <p>5.3b Light travels in straight paths until it hits an object then it can bend which is refraction.</p> <p>5.3 b A prism can be used to refract visible light. When the different wavelengths of light in visible light pass through a prism, they are bent at different angles. The colors of light we see are red, orange, yellow, green, blue, indigo, and violet.</p> <p>5.3c As light travels in straight paths it can also bounce off or be reflected from an object; if it passes through the object it is transmitted, Light can also be absorbed as heat.</p> <p>5.3d The relative terms <i>transparent</i>, <i>translucent</i>, and <i>opaque</i> indicate the amount of light that passes through an object.</p> <p>5.3e Historical contributions in understanding light include the contribution of inventors and scientists.</p>	<ul style="list-style-type: none">• Diagram and label a representation of a light wave, including wavelength, peak, and trough. • Analyze the effects of a prism on white light and describe why this occurs.• Explain why a rainbow occurs.• Investigate refraction using prisms and water.• Investigate reflection using mirrors. • Explain the terms <i>transparent</i>, <i>translucent</i>, and <i>opaque</i>, and give an example of each.• Describe the contributions of Galileo Galilei, Robert Hook, Anton van Leeuwenhoek, and Isaac Newton in creating and using optical tools.